AGRICULTURAL NEWS

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This publication carries information regarding new developments of interest to agriculture based on laboratory and field investigations by the Du Pont Company. It also contains published reports of investigations at agricultural experiment stations and other institutions as related to the Company's products and other subjects of agricultural interest.

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AGRICULTURAL NEWS LETTER

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EXCERPTS FROM ADDRESS BY CRAWFORD H. GREENEWALT

President, The Du Pont Company

National Press Club, Washington, D. C., September 29, 1949

"A business, whether it be big or little, to be successful must serve the public interest; and if a business grows it does so because the quality and price of its products win public confidence. Its ultimate size is then dictated only by the aggregate demand of its satisfied customers.

"True and lasting economic progress lies in encouraging the most efficient producers so that all people may have more and better things for their money.

"The Du Pont Company is successful and it is big, and in saying that I am merely reciting cause and effect. Those of us who are responsible for its management are thoroughly and painfully aware that that success comes about through public acceptance of the goods and services we offer. Should we ever fail in maintaining that acceptance, we will lose business and someone else will gain it. And that will bring a breakup of what has been called the 'Du Pont industrial empire' far more quickly and far more devastatingly than any outside attack.

"With limited resources for capital expenditure, we have no wish to strive for a fixed percentage of any market. To do so would prevent us from exploiting to the full the new developments produced in our research

laboratories, and that I think is our greatest challenge and our greatest responsibility.

"The Du Pont Company has existed for nearly one hundred and fifty years in an atmosphere of free and vigorous competition. We have done well under that system and we like it. Competition is a prod that keeps us continually on our toes. We think we are stronger because of it; we think we would be weaker without it. The opportunities for growth and service in our industry through the development of new things are limitless.

"Statistics on failures are difficult to come by but it is a fair approximation to say that not more than one out of five research dollars pays off. That means simply that if the direct cost of nylon research is say five million dollars, there is perhaps twenty-five million dollars worth of unsuccessful research that has to be paid for by that one successful development. We are playing with very blue chips indeed.

"There is much misconception about the relationship between big and little businesses. The idea has been put forward that big businesses grow by swallowing little businesses or by limiting their growth. Nothing could be farther from the truth. No little business could compete with us in nylon for the reason that no such business could bring together the capital and technical resources required for an efficient producing unit. We, on the other hand, have no interest in competing in spheres where we can make no substantial technical contribution, and there are many activities, particularly in fields of marketing and distribution, that small businesses can do better than we.

"We have had on our books for many years the Sherman antitrust law. The Du Pont Company is now and has always been heartily in favor of that law and the safeguards it provides for our system of free, competitive enterprise. Unfortunately that law states an objective and prescribes no rules so that the ideology of enforcement is left to the shifting winds of political thought.

"I do not want to leave the impression that business, whether large or small, has never made mistakes. A business is a group of people, subject to the same human frailties as people in any sphere of activity. We must not let the occasional error blind us to the overriding benefits our industrial system has brought. That system has made America the strongest nation on earth, and its free development will carry us to new heights.

"This nation has grown strong by allowing the forces of the market place to rule - the business laurels falling to whoever is able enough to win them, the law present to insure fair play.

"We can preserve competition only by allowing it to operate, and so to make effective the votes of thousands of satisfied customers."

METHOXYCHLOR AND OTHER INSECTICIDES (*)

Condensed version of an

address by

Donald C. Boughton
Animal Industry Division
Grasselli Chemicals Department
E. I. du Pont de Nemours & Co.

Insects and insect-like pests are formidable enemies. They have a great capacity for doing damage. In planning campaigns against them, we should keep in mind that they must breathe, eat, move about, reproduce, and die. They have sense organs, muscles, and nervous systems. They have enzyme systems and complex metabolic processes. Their tissues can be put out of commission by toxic substances. In devising control measures, we strive to hit some vulnerable point in the life cycle or upset some vital living process.

Two of the common pests around dairy barns are stable flies and horn flies. The stable fly bites cattle, especially on the legs, taking a drop or two of blood at each of several meals a day. These flies do not remain on the host animals for long periods of time. When stable flies are numerous, the pain from the bites, the continual irritation, and the loss of blood cause animals to lose weight, and milk yield is reduced.

The flies breed continuously during the warm months of the year, a complete cycle requiring from 20 to 60 days. A female stable fly lays five or six hundred eggs, usually in piles of straw, hay, feed, grass, weeds, etc., that have become water-soaked and contaminated with manure.

Horn flies are about half the size of the house fly. They hover in swarms over the backs of cattle, especially when the animals are in the pasture. The horn fly is also a blood sucker, crawling down among the hairs of the hair coat to reach the skin. It winters over as larvae or pupae in or underneath cattle dung. In April or May adult flies begin to appear and their numbers increase rapidly thereafter. The life cycle takes only 10 days to 2 weeks. In laying their eggs, the female flies apparently have a preference for freshly passed dung. The adult flies remain on the bodies of cattle both day and night, and when not feeding they may rest on the heads of their hosts, sometimes in such numbers as to form black rings around the bases of the horns. From this habit they get the name horn flies, but they do no damage to the horns. In the fall, frosts kill off the adults and drive the immature stages into hibernation in the dung.

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* This paper was delivered to the Wisconsin Pharmaceutical Association, Milwaukee, Wisconsin, September 27, 1949.

Cattle Lice Cause Trouble in Dairies

Cattle lice represent still another type of pest that causes trouble in the dairy. This group of insects has become so well adapted to the parasitic life upon the body of the host that wings are not required, these characteristic insect structures having been lost during their evolutionary specialization.

Chewing lice crawl freely over the skin between the hairs; they irritate the skin with sharp claws and chewing jaws. Sometimes they form colonies near the base of the tail or on the withers, which may become covered with a scurf under which the lice can be found feeding on the raw skin. Such massive attacks naturally weaken the animal, interfere with normal growth, and predispose to other diseases. Bloodsucking lice cause greater irritation because of their habit of piercing the skin to obtain blood. Heavy infestations stunt young animals and prevent normal milk production in older ones.

Lice are most abundant on cattle during the winter. The entire life cycle takes place on the host animal, the egg being attached to a hair and the nymph developing rapidly to sexual maturity, without leaving its host, in approximately two weeks.

Economic Losses Caused by Pests

To the user of insecticides, the irritation and pathology produced by pests are just so much economic loss. Accurate measures of losses sustained from the ravages of pests and parasites are difficult to obtain, because the effects are often insidious and interlocked with concurrent diseases and malnutrition. One investigator, however, has estimated that the control of horn flies one summer in a beef herd resulted in an increase in weight of approximately 50 pounds per animal over the weight expected had the herd been untreated.

Tests have shown that effective fly control on dairy cows does result in better milk production, sufficiently better to defray the cost of spraying many times over.

Function of Insecticides

There are two basic points which all of us recognize more or less clearly but seem to stumble over somewhat in our contacts with dairymen.

The first may be stated simply: Spraying is but one part of good husbandry. When one does a good job of spraying he is not justified in relaxing his other husbandry practices. To get the best results with almost all classes of good animal disease remedies it is necessary to dovetail their use with sanitary measures, feeding programs, and general good care of the animals. In some quarters, fear has been expressed that the more we continue to supply the farmer with efficient prophylactic and therapeutic remedies, the more careless he will be inclined to grow. Some of us adhere to the opposing school, which maintains that because the farmer will come to appreciate the

complementary effects of insecticidal sprays and good husbandry, he will be stimulated to practice good husbandry more than ever. The point is, we are not selling a magic pill but a new tool. We should not hestitate to rank the spray gun with the pitch fork.

The second point involves the concept of residual sprays, where the object is to spread a toxic chemical over surfaces traversed by the offending insect in such a manner that it will pick up a lethal dose by contact. Most users understand this in principle but many are confused in putting it into practice. Some, accustomed to the use of space sprays with quick knockdown, are disappointed when the flies don't shower down to the floor with the first squirt from a hand spray. Others simply fail to spray all the important surfaces. The latter must include not only the animals themselves and the surfaces of their particular barn but also the surfaces of surrounding buildings such as poultry houses, hog shelters, etc.

How Residual Sprays Do Their Job

In principle the function of a modern residual spray is not unlike that of the old fashioned fly paper. In the case of the spray, the fly flies off with his fatal dose of poison and dies later, whereas in the case of the fly paper he stays put and dies a sticky, lingering death right there. Fly paper is inefficient because its use leaves too much surrounding surface upon which the flies are safe.

There are many insecticides on the market, but only a few of these are of special interest as livestock sprays. DDT is undoubtedly the best-known. It was first synthesized back in 1874; its insecticidal properties were discovered by a Swiss worker in 1936-37. DDT fulfilled the wartime needs for controlling insects of medical importance and the postwar demand for it in agriculture. The chief properties contributing to the success of DDT are: wide range of insecticidal action; simple chemical structure, which permits ready synthesis; stability to light and air, which accounts for the enduring residual effect; and a relatively low mammalian toxicity. The description "relatively low" as applied to the toxicity of DDT to mammals was more applicable during the war than it is now. The Food and Drug Administration has recently ruled against the use of DDT on dairy cows, based on studies on the chronic toxicity of this compound and the knowledge that it is stored in the fat and secreted in the milk.

Symptoms of Insect Poisoned with DDT

How does DDT work on insects? The typical symptoms of DDT poisoning in insects demonstrate an effect on the neuromuscular system. The sequence of symptoms has been described for the roach as follows: (1) hyperextension of the legs with a consequent elevation of the center of gravity accompanied by postural instability; (2) increasing general trembling involving head, body, and appendages; (3) staggering gait, and hyperactivity resulting from stimuli of sound and touch; (4) repeated falling on the back and final inability to regain upright position; (5) continuing of leg movements of two types, a high-frequency tremor and a slower contraction and extension; (6) disappearance of

fast tremors leaving only isolated twitchings of the body wall and appendages; and (7) final sign of life is beating of the heart which may continue for a day or more. This gruesome picture of violent activity and prolonged prostration has suggested to some workers that the ultimate effects of DDT poisoning are metabolic exhaustion.

We do not know precisely how DDT gets into the insect body nor are we clear on just what it does to start the chain of events leading to death. Some workers are inclined to the view that insecticides like DDT are not specific insect poisons but only appear to be so because of their effective penetration of the insect cuticle. It can be demonstrated that solutions of cuticle containing chitin or of purified chitin will readily absorb DDT. We do know that DDT can produce its results even by contact with only the feet of the insect, one experimenter having shown that contact periods as short as two seconds were sufficient for some insects. Upon entering the insect's body, DDT somehow knocks out the nervous system, possibly by upsetting its enzyme systems.

Advantages of Methoxychlor Insecticide

Methoxychlor is a close chemical relative of DDT. It has a very practical advantage over DDT in being much less toxic to warm-blooded animals. It is a white solid, soluble in many of the common solvents, but insoluble in water. Methoxychlor was first synthesized in 1942. It was found to have insecticidal properties and has subsequently been subjected to numerous entomological and toxicological tests by various research groups. In 1949 methoxychlor received governmental approval for use on dairy cows.

Methoxychlor is effective against horn flies, stable flies, houseflies, cattle lice, fleas of cats and dogs, and numerous pests of crops. It possesses a long-lasting residual activity. When used as a cattle spray at a concentration of 0.5%, it will be effective normally for at least three weeks. During warm weather, local eradication of horn flies follows an application of 0.5% methoxychlor to all animals in a pasture.

The acute oral toxicity of methoxychlor to warm-blooded animals has been found to be one twenty-fourth that of DDT. Expressed as mean lethal dose in mg./kg., the relation is 250 for DDT to over 6,000 for methoxychlor. In chronic toxicity tests, it has been found that rats can ingest relatively large amounts of methoxychlor without adverse effect. The fate of methoxychlor within the mammalian body apparently differs from that of DDT. It is not stored in the fatty tissues to anywhere near the extent true of DDT and little or none appears in the milk of dairy cattle when the animals have been treated with amounts necessary for adequate control. Methoxychlor is less toxic than nicotine, rotenone, DDT, and technical benzene hexachloride. It has about the same order of toxicity to warm-blooded animals as pyrethrum. It is the safest to warm-blooded animals of the commercially available organic residual insecticides.

TESTS SHOW "NuGREEN" FERTILIZER COMPOUND SPRAYS PROVIDE CITRUS TREES WITH NEEDED NITROGEN THROUGH THEIR LEAVES

Evidence that nitrogen can be applied to citrus trees through their leaves -- as has been successfully done for eight years in the case of apples -- is accumulating.

Experiments in Arizona, California, and Florida indicate that "NuGreen" fertilizer compound, which contains 44% nitrogen in the form of urea, can provide a portion of the nitrogen requirements of oranges, lemons, tangerines, and grapefruit.

In releasing "NuGreen" for use by apple growers early in 1949, the Du Pont Company was able, on the basis of a considerable amount of experimental and development work, to make fairly precise recommendations as to what amounts should be used under given conditions. In the case of citrus trees, sufficient experience is not yet available to make accurate recommendations. In general, however, sprays containing 15 to 30 lbs. of "NuGreen" per 100 gallons of water have proved successful in experiments. Here, in a nutshell is what has been shown:

Experiments with lemons in California, performed under greenhouse conditions to avoid the effects of rain, showed that nitrogen from "NuGreen" sprays does go into the leaves and produces a marked response in the increase of green coloration.

Tests with oranges, tangerines and grapefruit in Florida showed that "NuGreen" sprays stimulated trees suffering from nitrogen deficiency (chlorosis), especially when such a condition had been caused by water damage. "NuGreen" sprays, when properly timed, also advanced the blooming of oranges in some Florida groves as much as two weeks. These sprays also produced a marked increase in the size of tangerines and grapefruit.

In the Arizona grapefruit areas, "NuGreen" may have a unique use. Growers there who heavily fertilize with nitrogen to improve bloom set must greatly reduce the nitrogen supply in the soil after the fruit has been set in order to maintain fruit quality. This is done by planting cover crops, which compete with the grapefruit trees for the nitrogen in the soil. By using a properly-timed spray of "NuGreen", however, it may be possible to bring the nitrogen up to the proper level without leaving any surplus to be removed.

Experiments in Arizona, California Described

Interest in feeding nitrogen to citrus trees by spraying their leaves is demonstrated by the fact that several articles on the subject have been recently published. This new system was described in the Arizona Farmer for May 14, 1949, The California Citrograph for May, and Citrus Leaves for June.

"From several sources," said the Citrus Leaves article, "comes evidence that plants can absorb nitrogen through the leaves if the nitrogen is in the correct form..... The best results have been accomplished by the use of urea in its various forms applied in sprays..... The experiments of Dr. A. R. C. Haas and Dr. W. W. Jones of the Citrus Experiment Station, Riverside, California, and of Dr. Lee Burkhart and associates in the Horticultural Department of the University of Arizona, Tucson, indicate that a new program of citrus tree nutrition is in the making."

Dr. Jones' work in applying nitrogen sprays to nitrogen-deficient orange trees was described as follows: "These experiments have been under way in the Mentone region and results have been quite favorable. According to Dr. Jones, it is anticipated that primary use of nitrogen-bearing sprays in orange groves will be confined to winter applications. During the winter the soil is cold and the trees are less active in their efforts to assimilate nitrogen from the soil. Quite frequently there is a deficiency of nitrogen at blossom time. So it is anticipated that by spraying nitrogen onto the leaves, the tree will obtain enough nitrogenous food to function properly at blossom and fruit setting time. In other words, there will be sufficient nitrogen to carry the tree through until warm weather, when its root system will be more active in drawing nitrogen from the soil."

Experiments With Lemons Described

The work which Dr. Haas conducted with lemons, under laboratory conditions, began in November, 1948, and continued through March, 1949. Dr. Haas describes his conclusions in The California Citrograph as follows:

"Lemon cuttings were grown in soil cultures that received a complete culture solution until considerable growth had taken place and then the nitrogen in the solution was omitted. The lemon leaves finally became severely nitrogen-deficient. Then the leaves of certain of the plants were sprayed with a strong solution of urea in tap water on November 12, 1948, followed in a few days by a marked improvement in the green color of the leaves and some new growth. Tip and marginal burn accompanied the increased color in the older leaves.

"On January 10, 1949, a similarly strong urea solution in tap water was again applied as a leaf spray to the cuttings previously sprayed but this time some lime was added and no injury resulted to any of the old or young leaves....

"The commercial value of nitrogen leaf sprays upon the vegetative and reproductive phases of growth involving quality and quantity production must await sufficient field trials in which other nutrient elements also are taken into consideration."

Arizona Grapefruit Problems Unique

As already mentioned, the advantage of spraying nitrogen for grapefruit trees in Arizona are rather novel. There, one seeks to reduce the amount of nitrogen in the soil shortly after the fruit has been set. This removal is

brought about by planting cover crops to compete with the trees for the nitrogen in the soil. Trees having regulated supplies of nitrogen between the time the fruit is set and when it matures produce fruit which is more acceptable as to size and is less coarse. However, it is essential that adequate supplies of nitrogen be available in the tree in early spring to care for the oncoming spring bloom. If the temperatures are low during the winter, the tree's absorption of nitrogen from the soil is greatly retarded. It is hoped, according to Dr. Burkhart, that by applying nitrogen through the leaves, adequate tree storage of nitrogen will be built up quickly before blossoming time.

An article in the Arizona Farmer of May 14, 1949, describes a spray program designed "to kill thrips, cause more fruit to set, cause more of it to stick through the June drop period, and cause last year's crop to stick into early summer." The formula includes 2,4-D, DDT, and "NuGreen" in the spray water. The trials took place at Tempe, in the Salt River Valley, and on the Yuma Mesa.

NOTE: A new booklet, called "Du Pont 'NuGreen' Fertilizer Compound -- Spray Nitrogen for Citrus Fruits" has been published by the Polychemicals Department. If you would like to get a copy, please send your request to:

Editor, Du Pont AGRICULTURAL NEWS LETTER, Wilmington, Del.

RESEARCH SEEKS MEANS TO DYE NEW DU PONT FIBER

ATLANTIC CITY, N. J. - Recent developments in research give promise of solving some of the problems of coloring "Orlon" acrylic fiber, the Du Pont Company's latest textile discovery, the American Association of Textile Chemists and Colorists was told here recently.

A paper presented by a Du Pont chemist at the association's annual convention here also made it clear that commercial success for methods of dyeing "Orlon," now being developed in the laboratory, will mean that some day the fiber may be found in things as diverse as awnings and lingerie.

The paper was presented by Dr. Paul L. Meunier. It was prepared by him and Dr. Robert J. Thomas, an associate in the Technical Laboratory of Du Pont's Organic Chemicals Department at Deepwater Point, N. J.

Fiber's Physical Properties Enumerated

"Orlon" has physical properties that make it a natural for lingerie or for awnings, automobile tops, and even industrial filter cloths. It feels like silk. But it also resists sunlight and weathering-- better than any known fiber-- and dilute mineral acids, solvents, oils, and greases.

Some of these properties, plus its resistance to water, make "Orlon" difficult to dye. But Dr. Meunier disclosed that it has been possible in the laboratory to make the fiber absorb colors with outstanding fastness to washing.

"Orlon" first will be produced commercially - in the Fall of 1950 - in the form of continuous filament and in this form will not be dyeable by orthodox procedures except in pastel shades, Dr. Meunier said. On the other hand, he observed, its resistance to staining by many classes of dyes makes it an "ideal" yarn for use as a decorative-effect thread in piece-dyed fabrics. A plant to produce "Orlon" is now under construction at Camden, S. C.

BETTER STANDS OF GRASSES AND SMALL LEGUMES OBTAINED WITH SEEDS TREATED WITH "ARASAN" SEED DISINFECTANT

Use of chemicals on the seed of grasses and small legumes sowed on lawns, pastures, reclaimed gullies, and other places is recommended by the Du Pont Company after extensive greenhouse and field tests.

Better stands of alfalfa, White Dutch Clover, Kentucky Blue Grass, and other grasses and small legumes were obtained by treating the seed before planting. Seed treated with "Arasan" seed disinfectant was found to produce stands running anywhere from 10% to 150% better than untreated, even under extreme conditions, in tests conducted at the Du Pont Semesan Laboratory in Minquadale, Delaware, and at other experimental stations.

Ordinarily, poor stands in lawns or pastures are caused by an obscure and seldom recognized disease. It is really a phase of root rot, which causes pre-emergence blight. Seedlings that survive the disease often show but little evidence of it. However, by digging into the soil or examining the old vegetation, it will often be found that, although the seed did germinate, the roots and the tops of the seedlings were killed before the plants came through the ground, or became established.

Small Seeds Carry Little Food Reserve

The seeds of grass and small legumes, being very small in size, carry little food reserve to see them through the period from germination until the seedlings become established. For this reason, they can be easily killed off by adverse weather conditions and disease. Anything that helps the seedling get past this stage -- where seedling mortality is so high -- is important. And that is where it is advantageous to treat the seed with the proper chemicals before planting.

The purpose of treating seed is to protect it from the growth of fungi on the seed and in the soil which cause seed decay, damping-off, seedling blights and root rots. Although the science of treating seeds is at least three centuries old, seed treating has only become standard procedure for grains, sugar beets, and cotton since World War I. There is also considerable use of chemicals to treat seed of peanuts, sorghum, rice, and of many vegetables, especially those used for canning. Until recently, however, there was little knowledge about the usefulness of treating grass seeds and seeds of small legumes. Du Pont laboratories and state experiment stations have turned to this field in the last few years.

Repeated tests showed that Kentucky Blue Grass gave at least 10% better stands when the seed had been treated with eight ounces of "Arasan" per 100 pounds of seed. Bent grasses showed increased stands of 25%, and Dutch Clover of 50%, when treated with 12 ounces of "Arasan" per 100 pounds. A regular lawn grass mixture containing Poa trivialis chewings and red fesque, Kentucky Blue Grass, Highland Bent and Timothy, when treated with 8 ounces of

"Arasan" per 100 pounds of seed produced a final stand containing 46 1/2% more plants than the untreated seed.

Alfalfa Stands Increased with Use of "Arasan"

Pasture legumes and small seeded legumes such as alfalfa have also shown big increases in stand when treated. Alfalfa seed, treated at the rate of eight ounces of "Arasan" per 100 pounds, gave increased stands of as high as 89%.

The active ingredient of "Arasan" seed disinfectant is an organic sulfur compound called tetramethyl thiuramdisulfide. It does not contain mercury or any other metal. It can be used either as a dust, or in a slurry or water-suspension. The treatment of the seed can be done either by the wholesale seed distributor, or the purchaser of seed. "Arasan" can be obtained in packages as small as 3/4 of an ounce, for the use of those who want to treat the seed of their lawn grass at home. This can be easily done by mixing the seed and the "Arasan" in a large glass jar, and shaking well.

DU PONT INTRODUCES ENAMELS FOR FARM MACHINERY

A new line of quick-drying synthetic enamels, formulated especially for tractors, bulldozers, and other farm and road machinery has been placed on the market by the Du Pont Company.

Called Du Pont Tractor and Implement Enamels, they are made with synthetic semi-alkyd resins which give them unusual toughness. They come in 11 colors -- four shades of yellow, two of orange, two of green, two of gray, and one red -- to match the colors used by the leading tractor and implement manufacturers.

The new finishes are designed to afford maximum protection against the effects of weather and rust. They also resist damage from chemical solutions, gasoline, oil, or grease. They can be easily applied by brush or spray-gun, and dry in eight to fifteen hours.

With the colors now available, any tractor, plow, or other implement needing paint after a repair job can be made to look like new. Refinishing also adds value to implements about to be traded in or sold at second-hand. Du Pont Tractor and Implement Enamels may be applied directly on wood and metal surfaces. This means they can also be used on wagons, lawn-mowers and tools, as well as on earth-moving machines, binders, reapers, and other agricultural machinery.

SCIENTISTS PUT MICROBES TO WORK MEASURING VITAMINS TO ONE 28-BILLIONTH OF AN OUNCE

Now scientists can measure the vitamins in foods in traces as tiny as one 28-billionth part of an ounce! By harnessing microbes in a new method of assay, the growth of these tiny organisms becomes the yardstick determining the vitamin content of the food under test.

The new method is used chiefly to measure vitamins of the B group, including thiamin (B_1), riboflavin (B_2), pyridoxine (B_6), biotin, niacin, folic acid, and pantothenic acid. Some of the amino acids, called the building stones of proteins, can also be measured by the new method.

The amounts of vitamin needed to produce a given unit of growth in rats or chicks provided the earliest yardsticks for determining the vitamin content of foods. Later, chemical assays, quicker and more accurate for some vitamins than the animal-feeding method, were developed.

The new methods of measurement was described by Dr. Robert F. Brooks in a recent issue of FARM RESEARCH, published at Geneva, N. Y., by the New York State Agricultural Experiment Station and the Cornell University Agricultural Experiment Station, Ithaca, N. Y. Dr. Brooks did research work in bacteriology, especially as applied to foods, at the Geneva station from 1937 to 1949. Last fall he became associate professor of botany at the University of Missouri, Columbia, Mo. Explaining the advantages of the new method, Dr. Brooks said:

"The microbiological assay is a useful tool for the study of vitamins in a variety of products.

"The results are available in a much shorter time than with animal feeding tests, and microbiological methods are adaptable to a number of vitamins for which no reliable chemical method exists."

Three Growth Indicators Used

The new way of measuring vitamins is based on growth of specific organisms in response to increasing amounts of vitamin. Dr. Brooks said there are three growth indicators used in the assays. Increased cloudiness, or turbidity, of the host media, increased acid production, or increased weight, may provide the indices, depending upon the vitamin and the type of test organism.

As an example of the new methods, Dr. Brooks told how cloudiness was used to measure niacin, the anti-pellagra vitamin, in frozen peas. Extracts are first made from the peas. A solution is next made with the extract in the strength of about a half gamma of niacin to five milliliters (about a teaspoonful) of solution. It takes about 28,000,000 gamma to make one ounce!

To assay the niacin content of the peas, five milliliters of a medium composed of all food substances except the niacin essential to the growth of the bacteria is placed in each one of a series of test tubes. To each of the tubes is then added the diluted pea extract in amounts that increase from none in the first tube to five milliliters of solution in the last. Distilled water in the amount needed to fill each tube to a volume of ten milliliters is then added. After being plugged and then sterilized, each tube is finally inoculated with a culture of the type of bacteria being used for the test.

Bacteria Extremely Sensitive to Vitamins

Using a photometer which measures the percentage of light transmitted through the cultured solutions, turbidity readings are made of each test tube. By matching these readings with readings made of another series of cultured solutions containing known amounts of niacin to establish standards, the concentration of niacin in the extract is determined.

Pyridoxine is assayed similarly, except that flasks are used and spores of a mold in suspension are used to inoculate the extract. The spores are incubated in the extract solution for five days, then the mold growth is removed, rolled into a ball on paper towelling to remove excess moisture, and dried in an oven. Pellets of the dried mycelium are then weighed and by comparison with a standard series the unknown pyridoxine content is determined.

An outstanding feature of the new assay method is the extreme sensitivity of the bacteria to the vitamin present, said Dr. Brooks. There is a variation in the effective range among the different vitamins and organisms used, but in general it has been found that the best response is obtained in the presence of from two-hundredths to two-tenths of a gamma of the vitamin.

Says Dr. Brooks, "the organism used in the determination of folic acid will respond to differences as small as one-thousandth of a gamma of folic acid, or about one 28-billionth of an ounce."

DU PONT STOCKHOLDERS MORE THAN 104,000

The Du Pont Company was owned by 104,448 different stockholders as of September 30, 1949. This was an increase of 4,785 over the number reported on June 30, 1949 and an increase of 9,547 since January 1, of 1949. Practically all the increase was in the number of holders of common stock. Since the four-for-one split of the common stock on June 15, 1949, the rate of increase of its holders has doubled.

DU PONT INTRODUCES "ARMALON" ETHYLENIC PLASTIC COATED FABRIC FOR TRUCKS, FARM MACHINERY SEATS AND OTHER USES

A new type upholstery coated fabric for trucks, farm equipment and other uses, offering toughness and long-lasting pliability indoors or out has been introduced by the Du Pont Company.

The new product is the result of wide chemical research, coupled with long development work. Seven years ago Du Pont began its search for a new coated fabric. It was looking for something that could stand heavy "seating-traffic", but would also remain soft and pliable after long service. It sought something that could stand all kinds of weather -- rain, snow or sunshine.

Experiments soon proved that it was impossible to get all these qualities with conventional coating materials. So, it was necessary to get an entirely new type of coating. This became possible when Du Pont laboratories developed a new polymer -- ethylenic plastic. This permits, for the first time, the manufacture of a coated fabric without plasticizer and without anti-oxidants.

The usual type of coated fabric consists of a textile base, coated with one of several materials -- pyroxylin, rubber, synthetic rubber, resins, drying oils or lacquers -- to which such other important ingredients as solvents, pigments, anti-oxidants and plasticizers have been added. But, with the development of the new Du Pont polymer, no plasticizer is needed to obtain the desired pliability of "Armalon." There is no chemical that may eventually dry or massage out in service. So, instead of stiffening with age, a seat upholstered with "Armalon" will be just as pliable, or even more so, after long hard service and exposure to the elements.

Cushions Can Stand All Types of Weather

"Armalon" is produced at the Fairfield, Conn., plant of the Fabrics Division of the Du Pont Company. In its development, the Fairfield laboratory had the cooperation of the Experimental Station of the Chemical Department at Wilmington, Del., and the research facilities of other departments.

The lengthy field trials and laboratory tests, made before production of "Armalon" ethylenic plastic coated fabric was started, included tests for pliability, flexibility, toughness, edge wear, abrasion resistance, and ability to resist heat and cold. "Armalon" was exposed to heat, strong sunlight, and rain at Du Pont's "test farm" at Hialeah, Florida. Its compatibility with all types of cushion paddings was thoroughly tried out. It was service tested on a wide variety of seats, used either indoors or out-of-doors -- on bulldozers, boats, trucks, farm tractors, locomotives and amusement park rides. Only then was Du Pont itself convinced that it had a truly outstanding upholstery material.

WORLD'S SAFETY RECORD ESTABLISHED IN DU PONT PLANT

Establishment of a new world's safety record won a special award from the National Safety Council for the Martinsville, Va., nylon plant of the Du Pont Company recently. The council also awarded Du Pont its distinguished service-to-safety pennant in recognition of the company-wide safety program of the past four years. This is the highest honor granted by the council.

Both were presented on a "Cavalcade of America" radio program by Ned H. Dearborn of Chicago, president of the National Safety Council. W. Donald Hartford, manager of the Martinsville plant, accepted a bronze plaque in recognition of the world record, and H. L. Miner, manager of the company's Safety and Fire Protection Division, accepted the pennant on behalf of the company.

The Martinsville plant, which manufactures nylon yarn, set a new world's record of approximately 21,000,000 man-hours without a lost-time injury to any employee. It has been operating nearly seven years without a lost-time injury.

Previous World's Record Established in 1945

The previous world's record of 18,871,795 man-hours was set by the Du Pont Company's nylon yarn plant at Seaford, Del., between October, 1939, and April, 1945.

Mr. Miner pointed out that if the Martinsville plant had had the same injury rate as that prevailing in industry as a whole during this period, "at least 250 Martinsville men and women would have been seriously injured and 15 of them would have been killed or permanently disabled."

The injury rate for the company as a whole last year was 0.8 lost-time injuries per 1,000,000 man-hours worked, which was less than one-tenth that of the average for all U. S. industry.

In making the awards, Mr. Dearborn hailed Du Pont as "one of the most safety-minded organizations in the world."

BETTER THINGS FOR BETTER LIVING . . . THROUGH CHEMISTRY